The Relationship Between Human Influenza Pandemics and Avian Influenza
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A pandemic is an infectious disease outbreak that is generally worldwide and can affect a high proportion of the human population.

Influenza viruses infect humans as well as a variety of animal species (including birds, swine, and horses). Ordinarily, the strains of influenza viruses that infect one species (such as birds) do not infect other species, although occasionally there can be some transmission to another species. (A current example of cross-species transmission involves infections in humans with the avian, or bird, influenza A [H5N1] virus.) But even when such cross-species transmission occurs, the virus is generally not well adapted to the new host species and does not undergo further sustained transmission within this new species.

A human influenza pandemic occurs when a novel (new) strain of influenza virus emerges which is able to infect humans and cause serious illness, and which has the ability to spread easily from person to person in the same way as seasonal ("normal") influenza viruses – by coughing and sneezing. Because the virus is new, essentially no one will have pre-existing immunity to it. This increases the likelihood that people who are exposed to the new virus will become infected, and once infected may develop serious disease.

Note that this is in contrast to the situation with seasonal influenza, which occurs every year. The particular seasonal influenza viruses that will cause disease during this year's influenza season, while differing somewhat from the seasonal influenza viruses that caused disease in preceding years, are still related to these earlier viruses – which is to say that this year's seasonal influenza viruses are not novel viruses. Because many persons have had contact with the earlier, related viruses, they will have at least some pre-existing immunity to this year's viruses, and thus will be less likely to become infected, or to develop severe illness if they do become infected. In addition, influenza vaccines are developed each year, and those persons who are vaccinated should have enhanced immunity against the current year's seasonal influenza viruses.

Although seasonal influenza occurs every year, pandemic influenza is a much less common occurrence. During the 20th century, only three pandemics occurred: "Spanish influenza" in 1918, "Asian influenza" in 1957, and "Hong Kong influenza" in 1968.

What are the sources of the novel influenza viruses that, at infrequent intervals, cause influenza pandemics?

- A novel influenza virus capable of causing a pandemic can arise when some of the genes from an avian influenza virus mix (reassort) with some of the genes from a human influenza virus, resulting in the creation of a new hybrid influenza virus. This process can occur when a single animal (for example, a human or a pig) is simultaneously co-infected by both a human influenza virus and an avian influenza virus. In this situation, genes from the human and avian viruses can reassort and potentially create a new hybrid virus (a novel virus) which has the ability to spread readily from person to person and cause serious illness. This type of reassortment process is thought to have created the viruses which caused the 1957 and 1968 influenza pandemics.

- Novel influenza viruses that can cause influenza pandemics may also be the result of a series of genetic mutations in an avian influenza virus which give it, in its new form, the ability to spread

easily, and cause serious disease, in human populations. Note that the novel virus that results from these genetic mutations remains an avian virus, but one with the capacity for efficient human-to-human transmission. It is reported that the virus responsible for the 1918 influenza pandemic appears to have been an avian virus, and not a hybrid virus that resulted from a genetic reassortment process.

What is the H5N1 avian influenza virus, and why is it of concern to health officials? The H5N1 influenza virus is one of 16 different known subtypes of avian influenza viruses. H5N1 viruses have been found in birds in several different countries. As the spread of H5N1 infection among birds increases, so also does the opportunity for H5N1 to be transmitted directly from birds to humans. Recently, human H5N1 infections, many of which resulted in serious illness and death, have been reported in persons in several Asian countries during large H5N1 outbreaks among poultry. If cases of human infection increase, certain people who come to be simultaneously infected with avian (H5N1) and human influenza strains could become, as described above, "mixing vessels" for the creation of a new pandemic influenza virus. Another possibility is that the H5N1 virus might of itself undergo the necessary genetic mutations which would allow it to become readily transmissible from person to person, resulting in a pandemic. However, it is also possible that neither of these scenarios will occur, and thus the H5N1 virus will not produce a human influenza pandemic. It is currently not possible to predict which of these alternatives will take place, but efforts to closely monitor the situation and make preparations for a possible pandemic are warranted, and will continue to take place throughout the world.

References

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